SMART HELMET FOR MOTORCYCLES

by

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A comprehensive project report has been submitted in partial fulfillment of the requirements for the degree of

Bachelor of Technology

in

ELECTRONICS & COMMUNICATION ENGINEERING

Under the supervision of

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May, 2018

CERTIFICATE OF APPROVAL

This is to certify that the project titled "**Smart Helmet for Motorcycles**" carried out by

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for the partial fulfillment of the requirements for B.Tech degree in **Electronics and Communication Engineering** from **Maulana Abul Kalam Azad University of Technology, West Bengal** is absolutely based on his own work under the supervision of Mrs**. Arpita Ghosh**. The contents of this thesis, in full or in parts, have not been submitted to any other Institute or University for the award of any degree or diploma.

Optional in case of External Supervisor

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Designation and Department
Institute

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DECLARATION

"We Do hereby declare that this submission is our own work conformed to the norms and guidelines given in the Ethical Code of Conduct of the Institute and that, to the best of our knowledge and belief, it contains no material previously written by another neither person nor material (data, theoretical analysis, figures, and text) which has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgement has been made in the text."

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CERTIFICATE of ACCEPTANCE

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is hereby recommended to be accepted for the partial fulfillment of the requirements for B.Tech degree in **Electronics and Communication Engineering** from **Maulana Abul Kalam Azad University of Technology, West Bengal**

Name of the Examiner Signature with Date

1. ……

2.……..……..

3.……

4. ……..……

ABSTRACT

A smart helmet is a special idea which makes motorcycle driving safer than before.It is a way to stop starting of vehicles without wearing helmet or even if the driver is boozed. In addition, it has a great feature of detecting accidents and informs specific people via SMS with location and speed of the bike before the accident occurs with the help of GPS GSM based tracking system, thus aiding ambulance to reach the correct location.We want to implement all the sensors within the helmet, which will send the information to the module connected with the bike engine wirelessly.

This smart bike helmet system will have two modules, one on the helmet and another one on the bike. Alcohol sensor and helmet sensor (i.e switch) are attached with the helmet module and vibration sensor, GPS and GSM are connected with the module on the bike. These two modules communicate wirelessly using RF transmitter and receiver with encoder and decoder, using arduino as microcontroller.

CONTENTS

LIST OF SYMBOLS

V- Voltage
K-Kilo
Ω-Ohm
D-Decoder
E-Encoder

LIST OF ABBREVIATIONS

GPS	**Global Positioning System**
GSM	**Global System for Mobile**
SOS	**Save Our Souls**

LIST OF FIGURES

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Chapter 1

Introduction

The proposed project work presents the smart helmet that ensures that the rider cannot start the bike without wearing it. This helmet uses simple cable replacement for wirelessly switching on a bike, so that the bike would not start without both the key and the helmet. Also, whenever the driver starts ignition, the alcohol sensor measures the content of the alcohol in his breath and automatically switches off the bike if he is drunken.

To make driving more safe GSM and GPS technology is used.Vibration sensors are placed in different places of helmet where the probability of hitting is more which are connected to microcontroller board. So when the rider crashes and the helmet hit the ground, these sensors sense and gives to the microcontroller board, then controller extract GPS data using the GPS module that is interfaced to it. When the data exceeds minimum stress limit then GSM module automatically sends message to ambulance or family members.

1.1. Problem Definition

ROAD traffic crashes take the lives of nearly 1.3 million every year and injure 20-50 million more in the world. According to Global status report on road safety 2013 total number of road traffic deaths remains unacceptably high at 1.24 million per year. Only 28 countries, covering 7% of the world's population, have comprehensive road safety laws on five key risk factors: drinking and driving, speeding, and failing to use motorcycle helmets, seat-belts and child restraints. So, to overcome from this problem this smart helmet is being introduced which helps to reduce number of accidents that takes every day and also helps to reduce death ratio.

In countries like India where bikes are more prevalent many people die due to carelessness caused in wearing motorcycle helmets.Even though there have been continuous awareness from the government authorities regarding helmets and seat belts a majority of the drivers do not heed them.

Most of the people use traditional helmets just to prevent from challan done by traffic control police not for the safety purposes. So, these helmets do not ensure the safety of the driver.For two-wheeler rider, Helmet act as a basic protection device. But it does not ensure whether the rider strictly follows the traffic rules or not. So, to overcome from this problem the smart helmet can be used.

Figure 1.1 No of deaths due to road accidents

1.2. Problem Statement

The Smart helmet has two modules of operation i.e. one receiver part and one is transmitter part. The transmitter part is embedded in the helmet itself whereas receiver part can be installed in any particular bike. Thus, wireless communication takes place between two modules.

In the transmitter module, pressure signal is sensed by pressure transducer which is situated inside the helmet. A comparator converts analog signal to digital signal and feeds as logic level 1 to the input of transmitter whereas transducer gives the output. When the user takes off the helmet then the output of transducer becomes zero and the input of the transmitter will get 0 as logic level. Also, MQ-3 gas detector (alcohol sensor) is used to detect the alcohol content from the breath of the rider. It can be placed just below the face defend so that it can sense it easily. If the rider is drunk, then the resistance value drops which leads to the sudden change in voltage value. Then this value transfers to the microcontroller and it prevents from the ignition of the bike under this case.

In the receiver module, a high level digital output will obtained by the output pin till the rider wears the helmet and the ignition unit circuit of the bike will be completed when this signal actuates the digital relay. When the rider takes off the helmet the relay opens and the connections of the circuit will get terminated. If someone unfortunately meets with an accident then it will be detected by vibration sensor and the location of that particular place will be send to his relatives as well as to nearby police station in the form of longitude and latitude values via GSM and GPS module.

BLOCK DIAGRAM:

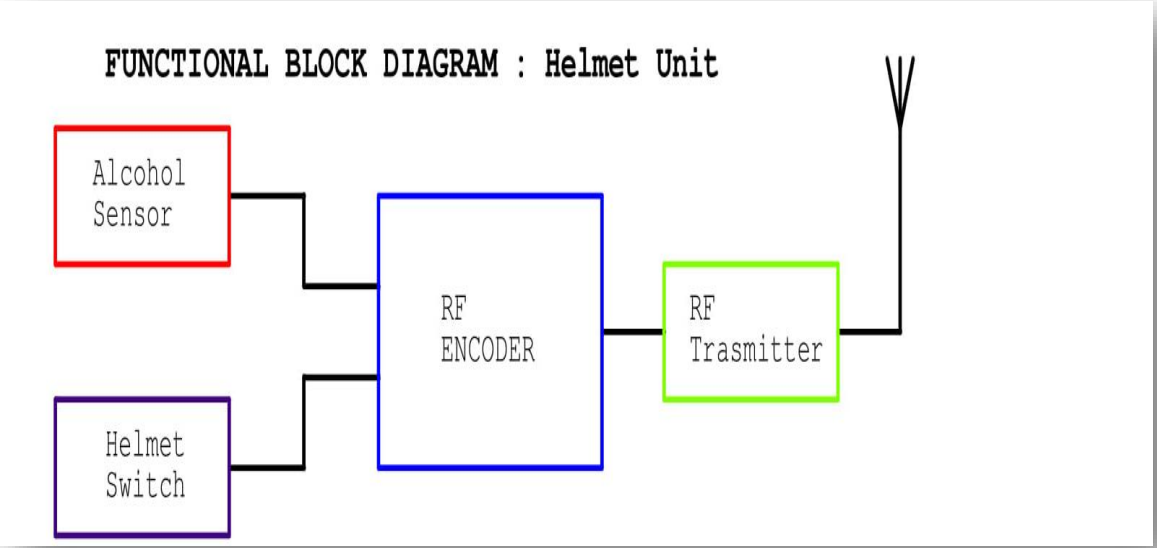

Figure 1.2a Transmitter section

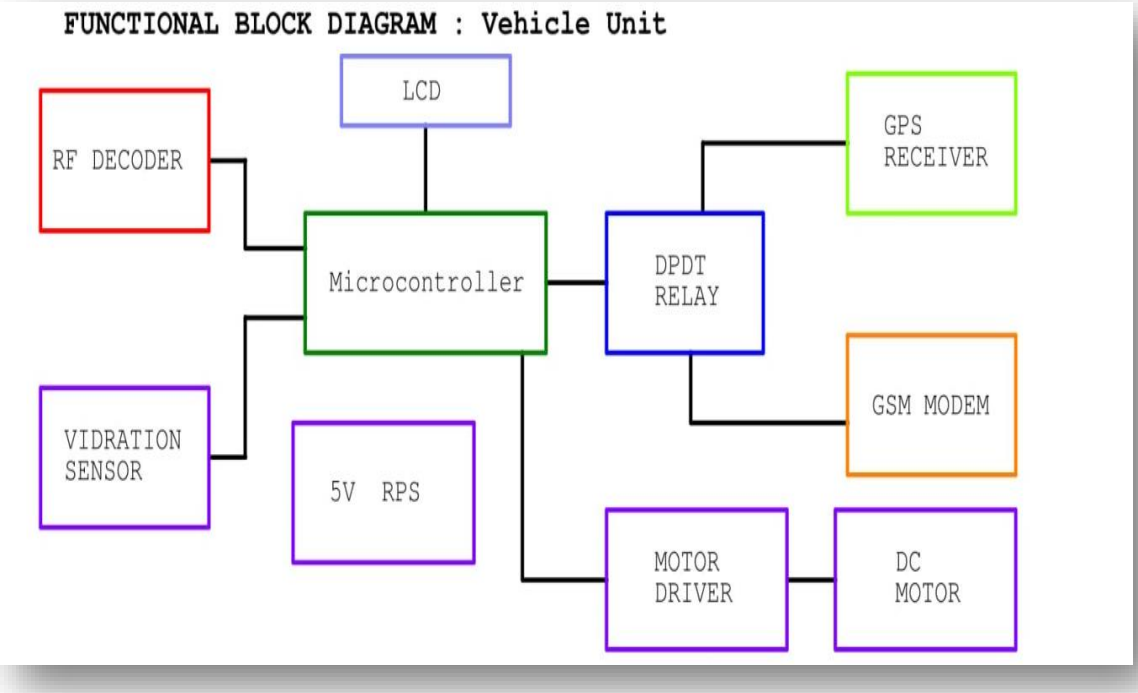

Figure 1.2b Receiver section

1.3. Analysis

Software used:

Table 1.3a Platform used for coding part

SL NO	NAME
1	ARDUINO IDE

Hardware used:

Table 2.3b Specifications of Hardware part used

SL NO	NAME	SPECIFICATION
1	GSM	SIM 800
2	GPS	NEO 6M 0001
3	MOTOR DRIVER	L293D
4	VIBRATION SENSOR	------
5	ALCOHOL SENSOR	MQ-3
6	ARDUINO BOARD	--------
7	MICROCONTROLLER	ATMEGA 328P
8	ENCODER	HT12E
9	DECODER	HT12D
10	VOLTAGE REGULATOR	LM7805
11	DIODES	BS170
12	VERO BOARD	------

CIRCUIT DIAGRAM (Hardware Part):

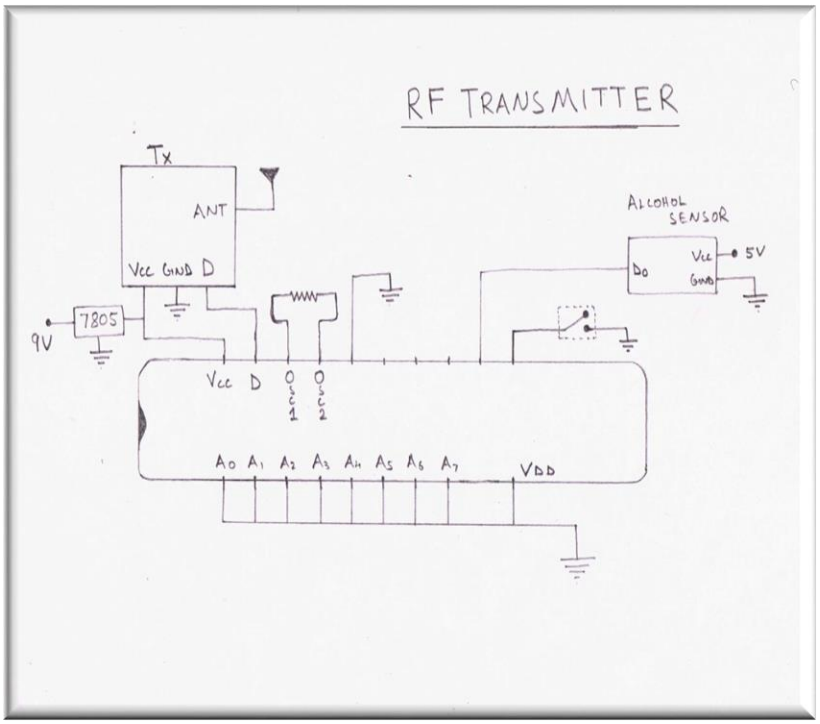

Figure 1.3a Circuit Diagram of Transmitter section

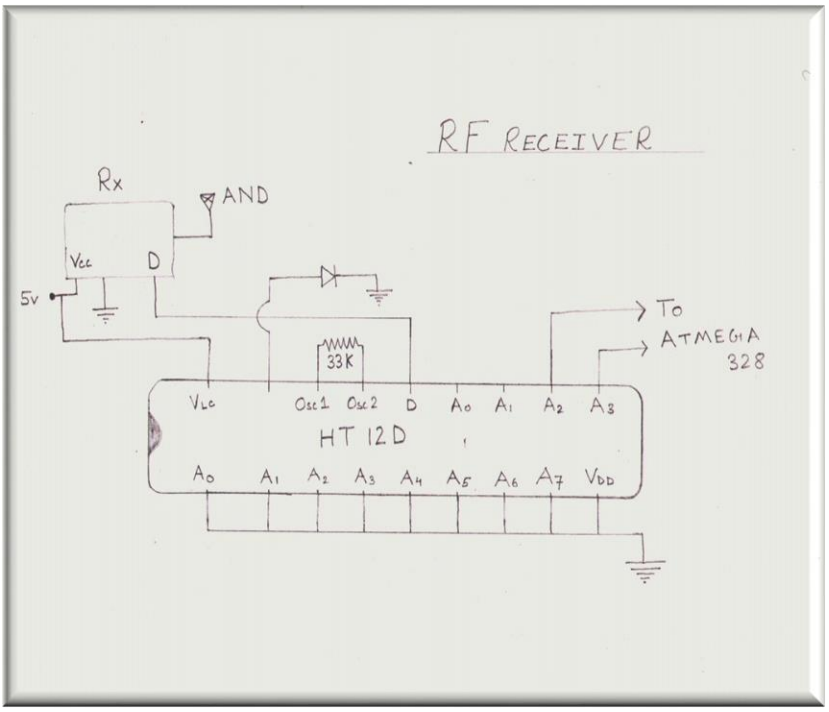

Figure 1.3b Circuit Diagram of Receiver section

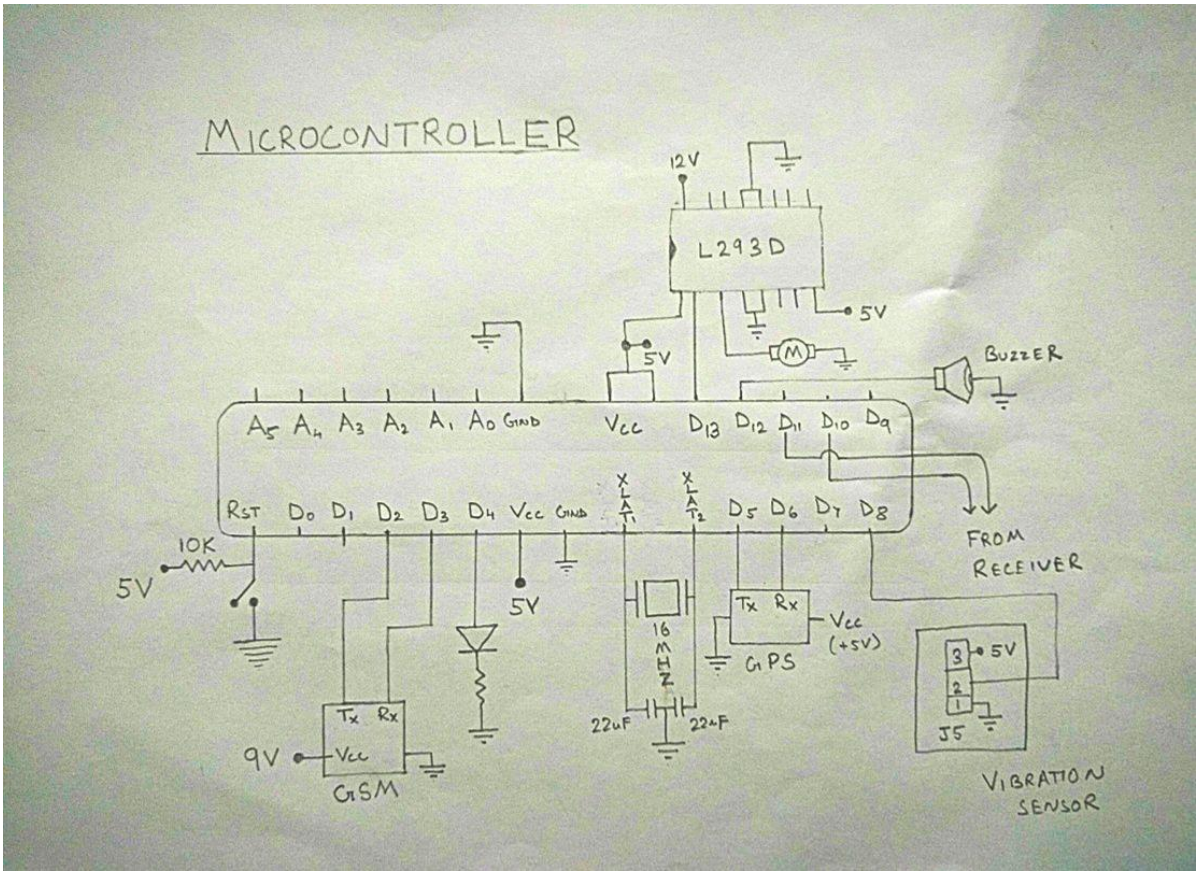

Figure 1.3c Circuit Diagram of Microcontroller section

DESCRIPTION OF THE COMPONENTS

Power Supply/Power Adapter

Power supply is the source of electrical power. Here, 5V power supply with the help of 7805 regulator is being used. Current will flow in the circuit in the form of direct current (DC).

Microcontroller

Figure 1.3d Atmega 328p

In this project, microcontroller ATMEGA 328p is used.It can be known as brain of this

circuit.. One can store commands and values which occur during the mechanism of circuit. All the signals are processed in microcontroller and send it to various other devices.

GSM Modem SIM800

Figure 1.3e Gsm Modem SIM800

GSM abbreviates as Global System for Mobile communication. It is used to establish connection between a computer and GSM system. It includes standard interfaces like RS232, USB, etc.. It is used to send messages through the SIM.

GPS Technology

Figure 1.3f GPS modem

The Global Positioning System (GPS) is a satellite-based navigation system which is used to detect the location where the accident will be taken place. It detects the Longitude and Latitude values of particular place and sends it to GSM module.

Vibration Sensor

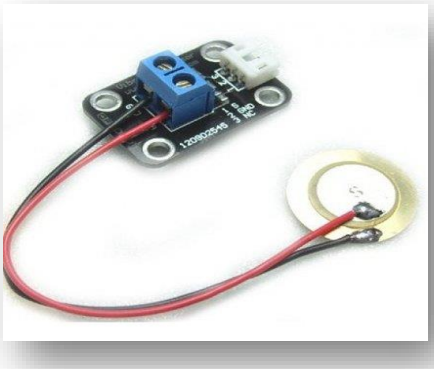

Figure 1.3g Vibration sensor

Vibration sensors are sensors for measuring, display, and analyzing linear velocity, displacement and proximity or acceleration.

Gas Sensor (MQ3)

Figure 1.3h Gas sensor

This sensor is used to detect alcohol content in biker's breath. It runs on voltage supply of 2-3.3V. If the sensitivity of MQ-3 is more than 0.04mg/L in breathe then the driver can't drive the bike.

CODING PART (SOFTWARE)

```
#include <TinyGPS.h>
String S="";
#include <SoftwareSerial.h>
TinyGPSgps;
SoftwareSerialhoe(6, 7);
#include "SIM900.h"

#include "sms.h"
SMSGSM sms;
boolean started=true;
boolnewData = false;
charsmsbuffer[160];
charcharbuf[80];
char n[20];
booleanflagsw=false;
booleanflagsen=false;
booleanflagvib=false;
boolean buzz=true;
void setup()
{
  pinMode(9, OUTPUT);
  pinMode(13, OUTPUT);
  pinMode(10, INPUT);
  pinMode(11, INPUT);
  pinMode(4, INPUT);
   hoe.begin(9600);
  Serial.begin(9600);
  Serial.println("GSM Shield testing.");
 // gsm.begin(9600);
 if (gsm.begin(9600))
```

```
  {
    Serial.println("\nstatus=READY");
    started=true;
   // digitalWrite(13, HIGH);
  }
hoe.begin(9600);
}
void loop()
{
  if(digitalRead(10)==0)
  {
    flagsw=true;
  }
  if(digitalRead(11)==0)
  {
    flagsen=true;
  }
  else if(digitalRead(11)==1)
  {
    flagsen=false;
  }

  if(flagsen&&flagsw)
  {
    digitalWrite(13, HIGH);
  }
  if(digitalRead(4)==0)
  {
    flagvib=true;
  }
  for (unsigned long start = millis(); millis() - start < 1000;)
```

```
{
  while (hoe.available())
  {

    char c = hoe.read();

    if (gps.encode(c))
    {
      newData = true;
    }
  }
}
if(newData&& started && buzz)
{
  digitalWrite(5, HIGH);
  delay(200);
  digitalWrite(5, LOW);
  delay(400);
  digitalWrite(5, HIGH);
  delay(200);
  digitalWrite(5, LOW);
  delay(400);
  digitalWrite(5, HIGH);
  delay(200);
  digitalWrite(5, LOW);
  delay(400);
  digitalWrite(5, HIGH);
  delay(500);
  digitalWrite(5, LOW);
  buzz=false;
}
```

```
 if (newData)
 {
   float flat, flon;

   gps.f_get_position(&flat, &flon);

   S="http://www.google.com/maps/place/";
   String slat=String(flat == TinyGPS::GPS_INVALID_F_ANGLE ? 0.0 :
flat, 6);
   String slon=String(flon == TinyGPS::GPS_INVALID_F_ANGLE ? 0.0 :
flon, 6);
   S=String(S+slat);
   S=String(S+",");
   S=String(S+slon);
 }
 if(flagvib)
 {
    sms.SendSMS("9007894696", "SOS MESSAGE IS BEING
DISPLAYED");
    S.toCharArray(charbuf, 60);

    if(started )
    {

     gsm.begin(9600);
     if(newData==true)
     {
       sms.SendSMS("9007894696", charbuf);

     }
     else
```

```
        sms.SendSMS("9007894696", "GPS SERVICE NOT READY.
PLEASE WAIT");
    }}}
```

WORKING OF PARTS IN DETAILS

Transmitter section: If the switch is pressed after wearing the helmet, it feeds a logic level 1 to the input of the transmitter through an encoder ht12e. If alcohol is detected in mq3 alcohol sensor, it feeds a logic level 0 and that 0 logic level is received by the receiver.

Receiver Section: When the biker wears the helmet and ON the switch, the logic level 1 is received by the receiver which gets decoded by the ht12d decoder and triggers the microcontroller and the motor gets on. When alcohol is detected the logic level 0 ta received and and motor gets off. When the vibration sensor gets triggered for an accident, gps and gsm both gets ON and SMS is sent along with the biker's location.

Microcontroller: In microcontroller, when logic signal 1 is triggered the motor driver l293d makes the motor on. When vibration sensor is triggered, the microcontroller is executed.GPS and GSM then gets on and the buzzer produces sound.

1.4. OUTCOME

FLOWCHART OF EVENTS

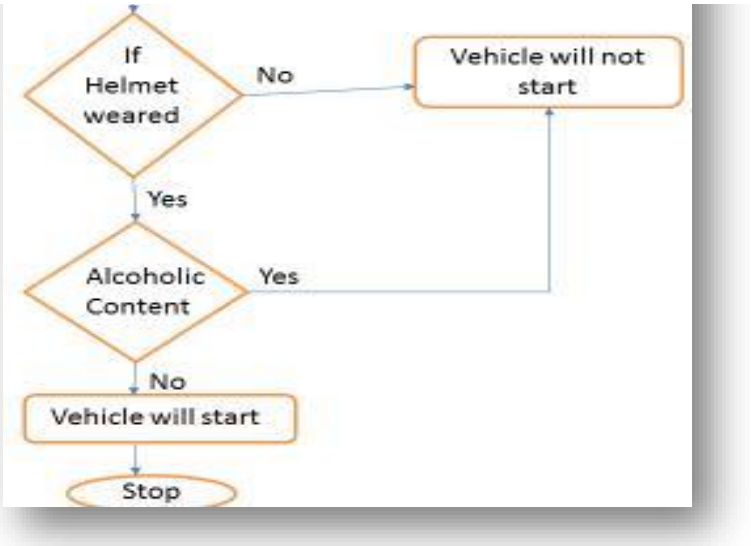

Figure 1.4a Ignition of bike

Figure 1.4b when accident takes place

IMPLEMENTATION

The project “Smart helmet for motorcycles” best suits to accomplish the following objectives-

1) STATUS OF RIDER WEARING HELMET

2) ALCOHOL CONTENT TEST

3) ACCIDENT DETECTION

4) ACCIDENT LOCATION

1) STATUS OF RIDER WEARING HELMET:

If the rider wears the helmet and press the switch, only then the motor will start. Without wearing the helmet, the motor will fail to start.

2) ALCOHOL CONTENT TEST:

Illegal consumption of alcohol at the time of driving is 0.08mg/L as per govt act.

But for demonstration purpose it is programmed to the threshold limit 0.04 mg/L.

If the sensitivity of MQ-3 is more than 0.04mg/L in breathe then the driver can't drive the bike.

3) ACCIDENT DETECTION:

A range of frequency generated depending upon vibration produced due to accident or obstacle. If frequency is greater than the threshold value then the vehicle unit shows accident detected.

4) ACCIDENT LOCATION:

Once, vehicle unit shows “Accident Detected” then GSM sends the location of accident with the help of GPS. It sends latitude and longitude continuously to saved sim numbers till ignition system is turned OFF.

PICTURES OF OUTCOME:

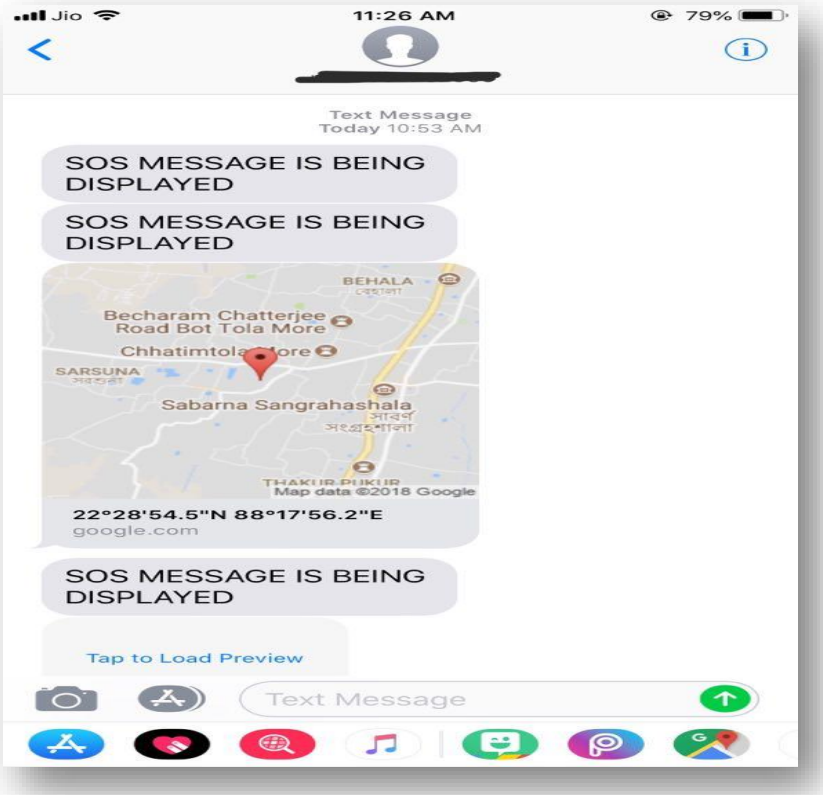

Figure 1.4c SOS message sent to contacts

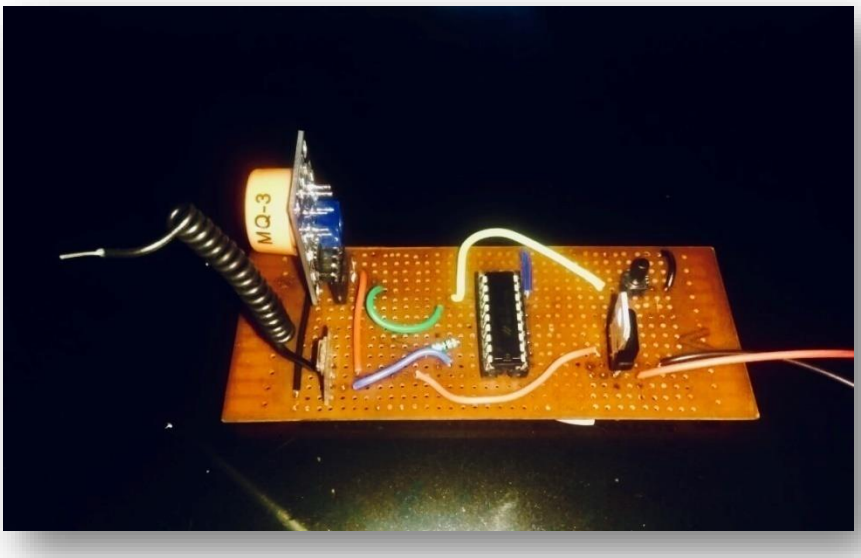

Figure 1.4d Veroboard implementation of transmitter part

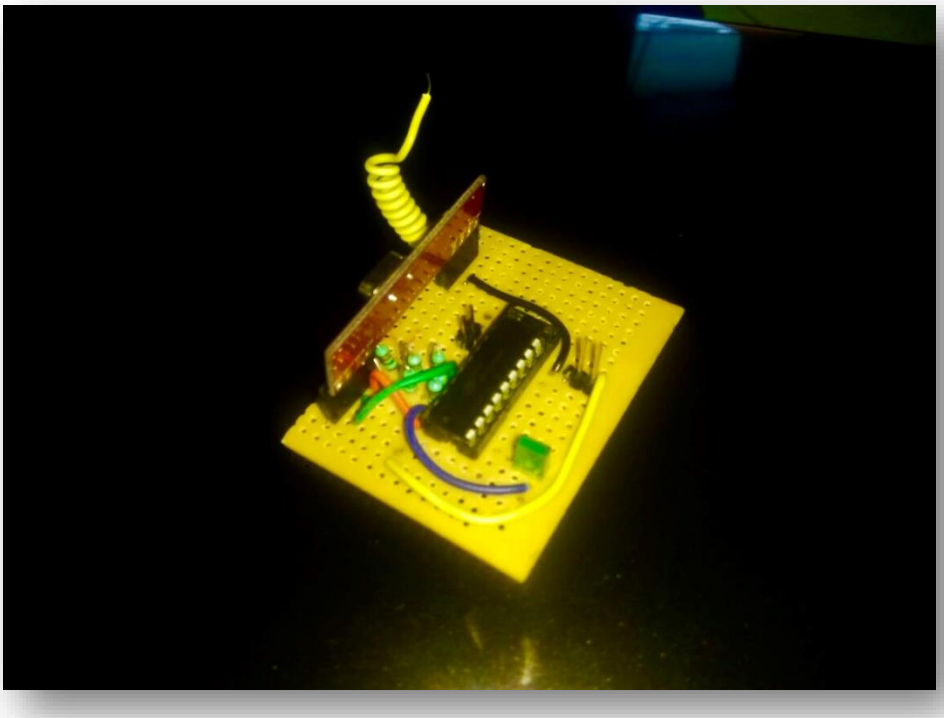

Figure 1.4e Veroboard implementation of receiver part

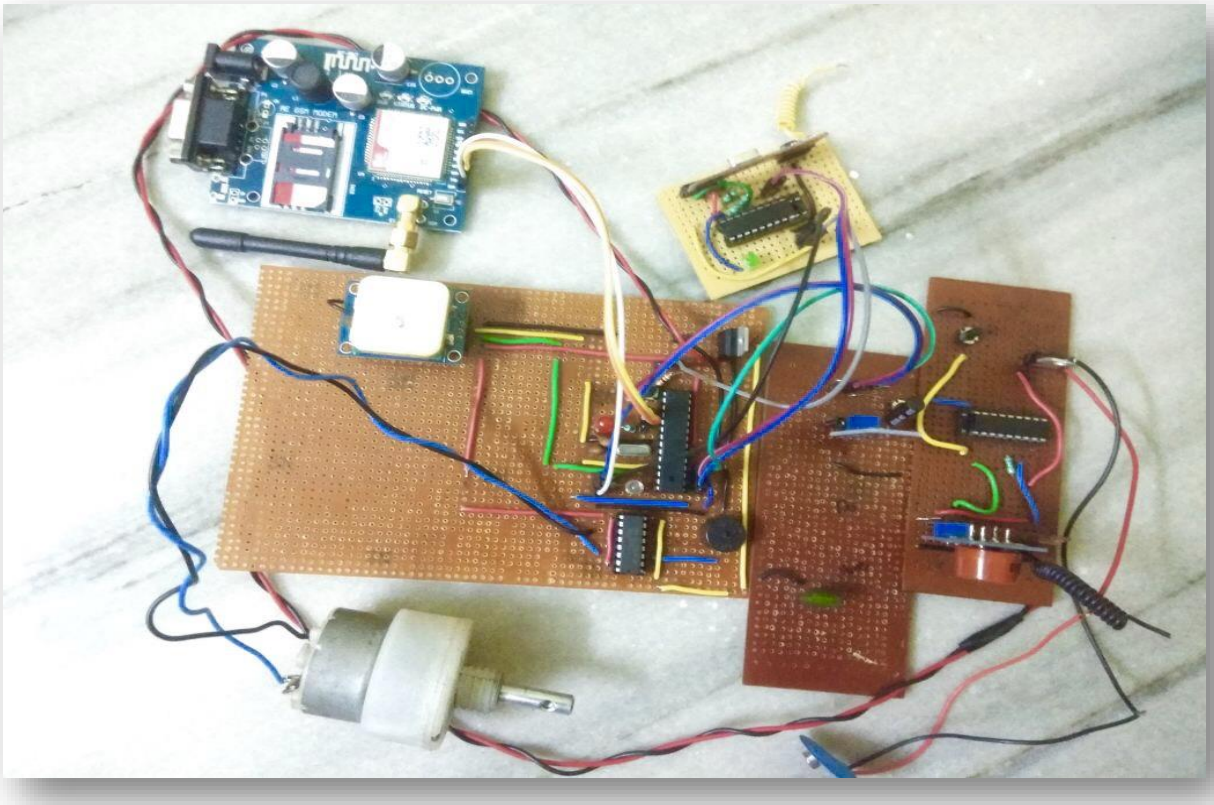

Figure 1.4f Overall circuit of Smart helmet

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